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ABSTRACT

This study was designed to examine Chicano and Anglo children's performance on several measures of field dependence/independence (FDI), including the Portable Rod and Frame Test (PRFT), the Children's Embedded Figures Test (CEFT), the Human Figure Drawing Task (HFDT), and the Block Design Test. Also examined was the relationship between FDI performance and performance on the verbal and analytical subtests of the Wechsler Intelligence Scale for Children - Revised (WISC-R). The effect of a test warm-up, or tuning procedure on FDI measures was assessed. Main findings of the study were: (1) no ethnicity by tuning interactions occurred, indicating that treatment effects did not differ between Chicanos and Anglos; (2) tuned Anglos scored higher than tuned Chicanos on Block Design and CEFT but the groups did not differ on PRFT or HFDT; (3) control Chicanos and Anglos did not differ on CEFT, PRFT or HFDT but did differ on Block Design; (4) Aptitude/tuning interactions emerged; and (5) Correlations between PRFT, CEFT, and HFDT averaged around .25 among controls and around .40 among tuned subjects--correlations with Block Design averaged .45. Research results identifying Chicanos as field dependent were not supported by this study. Tuning data suggest pretest procedures for adequate measurement of Chicano children's abilities. (Author/GK)

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CHICANO CHILDREN'S COGNITIVE STYLES: A Review of the Literature and Effects of a Pretest Intervention

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Introduction

Studies of educational achievement among Chicano[1] students indicate that, in general, they achieve far below Anglos[2] of the same age or school grade level. Earliest reports of Chicano student progress (Manuel, 1930) reveal limited achievement in the basic skills, and more recent data (U.S. Commission on Civil Rights, 1971) suggest that low achievement has continued.

Educational researchers have attempted to identify factors contributing to academic failure among Chicanos. Available studies can be categorized as those focusing on 1) school characteristics: curriculum, staff, policies and procedures; 2) student characteristics: student cognitive and affective aptitudes, language, socialization experiences, and socio-economic status; and 3) attempts to bridge the two factors by identifying the types of school programs that work best for students with different characteristics.

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[1]The term Chicano refers to persons living in the United States who either themselves, their parents or more remote ancestors were born in Mexico. It is also used to refer to persons who trace their lineage to Hispanic or Indo-Hispanic forebears who resided within Spanish or Mexican territory that is now part of the southwestern United States. As used in this paper, the term Chicano is interchangeable with the term Mexican American.

[2]The term Anglo or Anglo American refers to white persons in the United States who are not members of Spanish origin groups.

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One widely recognized line of research on student characteristics follows from Witkin's work on field dependence/independence as a cognitive style. Field dependence and field independence are the two ends of a continuum which describe an individual's ability to separate an item from its context in perceptual and analytical tasks. A field independent person is able to separate an item from the context, or is able to overcome the organization of the entire field, while the field dependent adheres to that field and is unable to separate items from it.

While cognitive style studies on Chicano children generally identify Chicanos as more field dependent, on average, than their Anglo peers, reviews of cognitive style research on Chicanos yield conflicting results. Ramirez and Castaneda (1974) conclude that cognitive style is central to understanding academic functioning of Chicano children, but Kagan and Buriel (1977) indicate that it is not meaningful to describe Chicanos as field dependent. This paper and the present study attempt to clarify some issues in the conflicting analysis of Chicano children's cognitive style.

Witkin's Theory

The field dependence/independence cognitive style construct grew out of work by Herman Witkin and his colleagues who first noted the existence of wide variation among individuals in their performance on the Rod and Frame Test, a test requiring the individual to locate the true vertical in a space lacking

ordinary environmental clues. Witkin noted that performance on the Rod and Frame was linked to performance on some other perceptual/analytical tasks, such as the Body-Adjustment Test and the Embedded Figures Test. All three tasks measure the extent to which the individual perceives part of a field as discrete from the whole.

In subsequent work, performance on the perceptual tasks was found to be related to performance on a variety of tasks, including those measuring problem-solving ability, ability to analyze and structure experience, and sense of separate identity (Witkin, et al., 1962). Witkin and colleagues thus concluded that there is a broad dimension which can be used to describe many aspects of an individual's functioning. They termed this dimension "psychological differentiation", and noted that while the typical progression in development is from less to more differentiated, some individuals do not move to the more analytical, articulated end of the dimension, but maintain a global approach to perception.

In enumerating the essential characteristics of the cognitive styles, Witkin noted that the styles encompass perceptual, intellectual, and personality functioning (Witkin, Moore, Goodenough & Cox, 1977). In addition, he and his colleagues noted that there is marked consistency in an individual's characteristic approach to a wide variety of tasks, and that an individual's style is stable over time (Witkin, et al., 1962). Differences in extent of differentiation were found

to be related to differences in childhood socialization experiences, with greater differentiation associatied with encouragement of separation and imparting of standards for regulation of impulse (Dyk, 1969; Witkin & Berry, 1975).

Witkin and his associates have carried out a large number of studies on their own behalf and have stimulated a large number of studies by other researchers. While Witkin, in general, sees this body of work as providing support for his differentiation theory, numerous problems can be identified in the theory and in the supporting studies.

Witkin is inconsistent in defining the meaning of style. He suggests that his theory describes equal, alternative styles as distinguished from "intelligence and other ability dimensions" (Witkin, et al., 1977) but he employs instruments measuring ability not a preferred mode of functioning and defines differentiation as a progression from less to more differentiated. These two separate aspects of Witkin's theory--ability versus style-- while not entirely irreconcilable, have caused much confusion and misunderstanding about his theory.

Reviewers of Witkin's work have chronicled a large number of problems in the degree of relationship among various field dependence/independence (FDI) measures and between these measures and other abilities. Witkin's concept arose out of correlations between performance on seemingly diverse tasks, among them the Rod and Frame Test (RFT) and the Embedded Figures

Test (EFT). It was theorized that underlying the high degree of relationship between these two tests was the ability to disembed an item from its context (Witkin, et al., 1962). Review of Witkin's work, as well as that of many supporting studies, reveals that though some of Witkin's correlations between EFT and RFT were statistically significant, several were not, and ranged from -.15 to .76 (Arbuthnot, 1972; Witkin, et al., 1962). When tests that are supposed to measure the same underlying ability are found to be uncorrelated or to correlate negatively in a large number of samples, the theory itself can be called into question.

Numerous researchers have suggested that the relationships among FDI measures and between FDI and other abilities and traits is explained by the common relationship between all of these scores and general intelligence. While Witkin has attempted to handle the issue by indicating that the high correlations between FDI measures and IQ are "carried by the intellectual" group of IQ subtests, (Witkin, Dyk, Faterson, Goodenough & Karp, 1963) rather than the verbal or attention-concentration subtests, he fails to identify "how much of the relationship is due to the G variance and how much to the primary-specific variance of the intellectual (subtests)" (Zigler, 1963b, p. 460).

Finally, Witkin's work and supporting studies have been much criticized for severe methodological problems which call into question their conclusions. Among these problems is the ambiguous and unreliable nature of the personality measures used

to infer characteristic behavior, the large number of studies based on only one measure of FDI (Wachtel, 1972), a practice clearly unwarranted given the zero and negative correlations among the measures in numerous studies (Cronbach, 1970), and the large number of studies based on measures which are derived from but often bear little resemblance to Witkin's measures (Arbuthnot, 1972).

Cognitive Style Work on Chicanos

Most of the studies involving Chicano students were undertaken in semi-rural, lower socio-economic communities in southern California, and involved children in public elementary schools, grades K-6. The studies were, in general, correlational and involved measurement of subjects on FDI measures, with no intervention of treatment prior to testing. Some of the studies related FDI test scores to school achievement, social orientation, role-taking, and assertiveness as well as comparing FDI performance among groups of Chicanos varying in generational level in the U.S., and in degree of identification with Mexican and Mexican American culture, language and history.

Out of ten rod and frame studies, Chicanos scored significantly more in the field dependent direction than Anglos in eight studies. In five studies employing embedded figures tests, no differences between Chicanos and Anglos were found. In some studies the differences between Chicano and Anglo students' rod and frame scores diminished as the grade level

increased; in others they did not. In virtually all studies, Mexican American females scored lower than Mexican American males, though sometimes only by a small amount.

The research on Chicano children shares many of the problems of the full body of field dependence/independence research. Of the thirteen FDI studies focusing on Chicano children, nine relied on only one measure of FDI, and in eight of those nine it was some version of the Rod and Frame Test. Of the eight studies, four used the Portable Rod and Frame Test and three used the Man-in-Frame Test. Though the various modified apparatuses are somewhat similar, some vary significantly and the test procedures can vary substantially.

In general, these studies did not examine the relationship among FDI measures, between FDI and performance on ability and intelliegence tests, nor did they control rigorously for SES differences. Only one study (Buriel, 1978) tested subjects on modifications of the two most used measures of FDI (RFT and EFT) and partial correlations revealed that the measures on average shared less than ten percent of their variance.

Among additional problems related to this group of studies is failure to provide evidence on the reliability and validity of measures in this population and failure to exhibit an understanding of the task requirements. Given the significant problems and limitations in the cognitive literature on Chicanos to date, it is clear that additional and more thorough study is necessary prior to the formulation of conclusions about the group as a whole.

The purpose of the present study was to examine differences between Chicano and Anglo children's cognitive styles using several standard FDI measures. A second aim of the study was to investigate the effect of a pre-test intervention which involved clarification of task instructions, provision of extra practice items, and suggestion of strategies for approaching the tasks.

Method

Subjects

The subjects were 120 fourth grade girls, 60 Chicanas[3] and 60 Anglos selected from among all fourth grade females in a northern California school district. The mean age of Chicanas was 10 years 1 month; the mean age of Anglos, 9 years 7 months. The first half of the subjects (30 Chicanas and 30 Anglos) were selected by simple random sampling. Evaluation of SES levels revealed substantial differences between the two ethnic groups. Thus, for the second half of the subjects, sequential sampling was utilized in order to select higher SES Chicanas and lower SES Anglos. The procedure failed to provide groups comparable on SES because of the essentially disparate nature of the two groups in the community.

Procedure

Two examiners tested all 120 subjects. All subjects were tested individually on all measures. Each examiner tested each child on a fixed set of tasks. All tests were administered to

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[3]The term Chicana refers to a female Mexican American. The term Chicano can be used to refer to persons of either sex. Because all study subjects were female, however, the term Chicana is generally used in this paper.

each child in a single session lasting an average of three hours. Standardized test procedures were followed, though ten of the Chicana subjects were tested in a combination of Spanish and English, based on information from the child and her parents, and on the author's assessment of the child's differential language abilities.

Design

The design was 2 (ethnicity) x 2 (treatment), with approximately 30 subjects in each cell. (An Anglo subject that was to be in the control group was inadvertantly provided the experimental treatment, resulting in unequal cell sizes.) For the first 60 subjects, assignment was random. The remaining 60 were assigned so that within each ethnic group the SES means in treatment and control groups were comparable.

Measures

Subjects were tested on four measures of field dependence/independence: the Portable Rod and Frame Test (PRFT), the Children's Embedded Figures Test (CEFT), the Block Design Test (BDT), and the Human Figure Drawing Task (HFDT).

The PRFT is a portable version of Witkin's Rod and Frame Test and correlates highly with the original (Otlman, 1968). Standard test instructions and procedures were used; accordingly each S was administered eight trials and no time limits were set. The score per trial is the number of degrees from 0 at which the child sets the rod as vertical. A perfect score is 0 and higher scores reflect greater errors. The total score is the average over eight trials.

The CEFT is a variation of the EFT designed for young children. The test consists of 25 items, and was administered following procedures outlined by Witkin (Witkin et al, 1971). Items are scored 1 for correct responses and 0 for failures, with the maximum possible score being 25.

The BDT is one of the performance subtests of the WISC-R. Witkin recommends use of the Block Design stating that it is "very similar in its requirements" to the other tests of field dependence/independence (Witkin, 1965, p. 324). The test consists of 11 items and was administered following procedures outlined by Wechsler (1974). Each item completed correctly within a time limit receives a minimum score, with bonus points given for items correctly completed in less than the allotted time. The maximum possible score is 62.

The HFDT is a task used frequently by Witkin to measure FDI and degree of body articulation. Because high correlations have been found between two drawings made on the same date for both Anglo and Chicano subjects (Harris, 1963; Laosa, 1978; Pirofski, 1975), Ss were asked to make one drawing. The drawing was scored following procedures developed by Harris (1963). The Harris scale includes 73 items and each item is scored 1 for presence or 0 for absence of a feature of the drawing.

The Wechsler Intelligence Scale for Children - Revised (WISC-R) was administered to all Ss in order to examine the relationship between FDI measures and WISC-R Verbal and Performance subtests. The ten basic subtests, and an additional verbal subtest, were administered following procedures outlined

by Wechsler (1974).

Reliability coefficients for all study measures for each of the four treatment by ethnicity groups show generally very high reliabilities and a high degree of similarity among the groups. The only low coefficients occurred for the Performance subtests of the WISC-R which are generally less accurate than the Verbal subtests.

Treatment

Unfamiliarity with a task can obstruct or alter performance on the task and can result in inaccurate and misleading test scores. The subject who does not understand the test assignment and who must guess at the "object of the game" loses valuable test time and generally performs poorly. Similarly, if test practice is so limited that the child is still learning to do the task during the actual trials, ability on the given type of task can be underestimated. Finally, if the child does not develop an effective approach to the task until well into the test, or if an organized strategy does not surface at all, the test may reflect the ease with which the child finds a strategy but not necessarily the child's ability on the given type of task. The treatment in this study was test tuning or warm-up. This involves the provision of training prior to testing and may include clarification of task requirements, extended practice, or suggestion of a strategy for approaching the task.

PRFT tuning procedures provided extended clarification of the concept of verticality, provision of practice trials using a mock, cardboard rod and frame with environmental clues visible,

but not on the apparatus itself, and warnings about the ease with which the frame could distort perception of the rod as vertical. Tuning on the CEFT involved provision of a strategy, extra practice items and guidance in use of strategies. BDT tuning procedures provided Ss with several strategies and clues for approaching the task as well as 4 extra practice items for the four-block designs, and 3 extra practice items for the nine-block designs. Tuning for the HFDT was very brief and involved a clarification of task requirements. During the actual testing, regular test administration procedures were followed and tuned Ss were provided no additional help.

Results

Descriptive statistics for the FDI measures were computed for each ethnicity by treatment group. Means and standard deviations are shown in Table 1. Analysis of variance summary tables for each of the FDI measures are shown in Table 2.

A comparison of the Anglo and Chicana control groups shows no significant differences between the two ethnic groups on PRFT, CEFT, and HFDT, but control Anglos scored significantly higher than control Chicanas on BDT. While the difference between the two groups on the PRFT appears large, it was not significant because there was substantial variabiilty among the scores in each of the groups.

Review of the analysis of variance summary tables reveals significant ethnicity main effects for CEFT and BDT. The ethnicity effect for BDT reflects the substantially higher scores for Anglo subjects in both treatment and control groups.

For CEFT the ethnicity effect, again in favor of Anglos, was essentially carried by the treatment group differences but also reflects a small difference between Anglo and Chicana control group means.

Significant treatment main effects were found on PFRT and BDT. The BDT effect reflects the significant positive impact of tuning on Ss in both ethnic groups. In contrast, the PRFT treatment effect reflects negative effect of tuning, as both Chicana and Anglo treatment groups' scores were substantially poorer than those of the control groups. (It will be recalled that PRFT scores reflect deviations from the upright, which is 0, and these larger scores indicate poorer performance.)

Table 1

Means and Standard Deviations of Four Field Dependence/Independence Measures by Ethnicity/Treatment Group

Variables	Chicanas			
	Treatment $n = 30$		Control $n = 30$	
	M	SD	M	SD
PRFT[a]	17.0	9.3	13.2	6.8
CEFT	17.1	4.7	16.4	3.4
HFDT	33.5	8.9	33.8	6.9
BDT	10.2	2.4	8.8	2.9
	Anglos			
	Treatment $n = 31$		Control $n = 29$	
PRFT[a]	16.7	12.5	10.0	7.6
CEFT	19.2	4.4	17.4	4.1
HFDT	36.3	6.8	33.7	7.1
BDT	12.5	3.1	10.4	2.7

[a]PRFT scores reflect deviations from the upright. Thus, larger scores indicate poorer performance.

Table 2

Analysis of Variance Summary Tables for PRFT, CEFT, HFDT, and BDT

Source of Variation	Sum of Squares	df	Mean Square	F	Signif.
		PRFT			
Ethnicity	106.13	1	106.13	1.22	.27
Treatment	778.41	1	778.41	8.95	.00
Interaction	78.63	1	78.63	0.90	.34
Residual	10003.81	115	86.99		
Total	10962.33	118	92.60		
		CEFT			
Ethnicity	70.88	1	70.88	3.99	.05
Treatment	41.80	1	41.80	2.35	.13
Interaction	11.85	1	11.85	0.67	.42
Residual	2043.55	115	17.77		
Total	2168.98	118	18.38		
		HFDT			
Ethnicity	56.60	1	56.60	1.01	.32
Treatment	42.74	1	42.74	0.76	.38
Interaction	65.14	1	65.14	1.17	.28
Residual	6429.50	115	55.91		
Total	6594.79	118	55.89		
		BDT			
Ethnicity	118.36	1	118.36	15.60	.00
Treatment	90.27	1	90.27	11.90	.00
Interaction	2.63	1	2.63	.35	.56
Residual	872.66	115	7.59		
Total	1085.64	118	9.20		

None of the treatment by ethnicity interactions was significant. The lack of an interaction effect indicates that no significant difference in treatment occurred between the two ethnic groups.

A third focus of the study was the relationship among the four FDI measures and between those measures and SES and WISC-R scores. Product-moment correlations were computed for the treatment and control groups within each ethnic group and for the sample as a whole and are shown in Table 3.

Review of the lower portions of each of the three matrices in Table 3 reveals generally low correlations among FDI measures for control group subjects. For the control group as a whole, correlations among the three most frequently used measures of FDI were .26, .31 and .25. These measures, then, shared at most ten percent of their variance. The BDT produced the highest correlations, .51, with both PRFT and CEFT, but only .18 with HFDT. A similar pattern of correlations occurred in each control ethnic group, with the exception of the relationship between PRFT and HFDT, which was .05, among Chicanas, and .64, among Anglos.

The upper portions of the matrices in Table 3 show correlations among measures for tuned subjects. Relationships among PRFT, CEFT, and HFDT increased for the total group and for each ethnic group. Most correlations among these measures were in the range of .40, a substantial increase over the average in the control groups of .28, and were similar in the two ethnic groups. As with the control groups, BDT consistently correlated

Table 3
Intercorrelations among Field Dependence/Independence Measures, SES, WISC-R Verbal and Performance by Ethnicity/Treatment Group

Variables		PRFT[a]	CEFT	HFDT	BD	SES	Verbal	Perform.
				Chicanas				
				Tuned				
PRFT	Control		.40	.45	.51	.27	.32	.35
CEFT		.21		.46	.59	.16	.55	.61
HFDT		.05	.27		.50	.28	.39	.43
BD		.42	.65	.15		.33	.41	.43
SES		.26	.20	-.09	.04		.47	-.07
WISC-R Verbal		.04	.32	.08	.30	-.02		.51
WISC-R Performance		.13	.36	.05	.52	.14	.62	
				Anglos				
				Tuned				
PRFT	Control		.29	.48	.56	.20	.43	.46
CEFT		.26		.38	.39	-.05	.43	.32
HFDT		.64	.24		.42	.31	.55	.42
BD		.54	.37	.24		.28	.49	.71
SES		.08	.30	-.04	.42		.15	.23
WISC-R Verbal		.13	.33	.30	.37	.37		.66
WISC-R Performance		.22	.50	.29	.46	.01	.44	
				Total Sample				
				Tuned				
PRFT	Control		.33	.44	.51	.17	.34	.40
CEFT		.26		.44	.51	.21	.51	.48
HFDT		.31	.25		.48	.33	.47	.44
BD		.51	.51	.18		.46	.57	.67
SES		.28	.25	-.03	.33		.54	.31
WISC-R Verbal		.17	.35	.17	.41	.41		.68
WISC-R Performance		.25	.45	.16	.54	.35	.61	

[a]On the PRFT, the largest scores reflect the lowest level of performance. Correlations between PRFT and other measures, whose largest scores reflect highest level of performance, are thus confusing. What are actually positive correlations between the constructs empirically, appear negative, and vice versa. To eliminate confusion, correlations involving PRFT have been corrected to reflect the true direction of the relationship.

highest with the other measures; these correlations were also in the .50 range.

Overall, the correlations between SES and the FDI measures were low, in part because of the restricted range of SES scores within each group. The correlations between the FDI measures and SES for the total group are somewhat higher than those for each ethnic group.

The correlations between the FDI measures and WISC-R Verbal, including the five basic verbal subtests and the optional, additional one, and WISC-R performance, including the basic performance subtests except Block Design, were moderate to high among treatment subjects and low to moderate among control group subjects. This pattern generally held true for the total tuned and control groups as well as for each of the ethnic groups. Of note is the fact that correlations between FDI measures and WISC-R were consistently higher than those among the FDI measures. Second, contrary to the expected higher correlations between FDI and Performance, there was little difference in the correlations of PRFT, CEFT, and HFDT with Performance and Verbal in tuned and control subjects.

Discussion

The conclusion to be drawn from this study's findings is that there is reason to question the meaningfulness of identifying Chicanos as more field dependent than their Anglo peers. As in all other studies, Anglo and Chicana Ss in the control groups did not differ in performance on CEFT and HFDT. Unlike other studies, control group Chicanas did not differ from

Anglos on PRFT.

This result is of importance for two reasons. First, it replicates Buriel's (1978) findings in his study of third and fourth grade children from a semi-rural southern California community. In that study, no differences emerged between Chicano and Anglo Ss on PRFT and CEFT. Second, the disparity in SES and WISC-R scores between Anglo and Chicana groups in this study, would have suggested that a concomitant difference might emerge on the FDI measures. The finding of no significant difference in field dependence/independence between two such disparate groups suggests that no difference may exist between the ethnic groups on FDI when controlling for SES and IQ scores.

A second finding of importance concerns the effect of the tuning intervention. The positive impact of tuning on BDT, for both groups, and on CEFT for Anglos, indicates that some subjects are unable to perform at their highest level on FDI tests under standard administration procedures, because of failure to understand the task or to put into effect skills which they possess. Further, the findings suggest that performance on analytical tasks, often thought to be measures of intelligence relatively uninfluenced by instruction, can be improved by tuning. Finally, the tuning effect indicates that performance on FDI measures is relatively easy to modify. The tuning procedures utilized in this study were brief, lasting a maximum of 15 minutes each and, in general, were much less detailed than other training interventions. The finding of an effect of FDI scores from such limited procedures again

challenges the notion that performance on style tests is stable and resistant to change.

Of interest was the lower level of tuning effect of Chicanas. Factors which may have caused this effect included the brief nature of the tuning, and the predominantly verbal mode utilized in tuning. For the low SES Chicanas, it is possible that a potentially lower degree of previous exposure to a variety of analytical games and tasks may have resulted in their needing more time at all stages of the tuning process. These Ss may have needed more time to familiarize themselves with the elements of the task prior to tuning, more and varied explanations and demonstrations of the suggested tuning strategies, and more time with practice items. It also is possible that tuning suggestions may not have been implemented by Chicana Ss because they may not have clearly understood the suggestions. Review of the tuning procedures reveals that tasks were introduced and described verbally, that suggestions were presented verbally, and that while some clues were illustrated visually, others were not. In many cases then, understanding the suggested problem solving strategy hinged not only on understanding of the vocabulary but involved the translation of words into some sort of internal representation of what was to be done, without the aid of visual stimuli.

A third important finding from this study is the surprisingly low correlations among the core FDI measures. The .30 range of the correlations for control group Ss indicate that the measures are substantially distinct. Despite the rise in

the correlations for the tuned group, the most frequently used measures were correlating around .40 and sharing only a bit more than 15% of their variance.

The low correlations among FDI measures found in the present study, especially with subjects tested under regular administration procedures, call into question the many studies involving Chicano samples in which one measure was used as the only operationalization of FDI. Further, the finding has implications for Witkin's theory. Witkin suggests that the measures are virtually equivalent and that an individual able to perform on one task is able to perform on the others. (Witkin et al., 1962)

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